38 - 67, 69, and 71 - 88 is unpatentable based on Litwin. Accordingly, the present rejection is traversed for substantially the same reasons presented in the December 2002 amendment. For the Examiner's convenience, those reasons are largely repeated below.

The varactors of the present invention operate on different principles than Litwin's varactors. These principles are appropriately incorporated into the language of the present claims. One of these principles entails adjusting the capacitance by causing an inversion layer to selectively appear and disappear. As discussed below, Litwin does not appear to control the varactor capacitance with such an inversion layer. The differences between the principles utilized in the present invention and those utilized by Litwin are discussed further below in showing why all of the present claims are patentable over the applied art.

On pages 8 of the December 2002 amendment, Applicant's Attorney first observed that:

> Litwin discloses a varactor formed with an insulated-gate field-effect transistor whose source region 13, 23, or 33 and drain region 14, 24, or 34 are situated in a well 12, 22, or 32. Source 13, 23, or 33 and drain 14, 24, or 34 are shorted together by way of common electrode C_A connected to both source electrode 17, 27, or 37 and drain electrode 18, 28, or 38. Electrode C_B is connected to gate electrode 19, 29, or 39 that contacts polysilicon gate electrode 16, 26, or 36.
>
> A first operational mode for Litwin's varactor is described at col. 5, lines 21 - 58, with respect to the schematic varactor diagram of Fig. 4 corresponding to the varactor of Fig. 1. A voltage is applied between electrodes C_A and C_B to produce a depletion layer, represented by depletion boundary 41, below the gate dielectric layer that underlies polysilicon gate electrode 16 in the varactor of Figs. 4 and 1. Litwin states that the capacitance between electrodes C_A and C_B is the series combination of the gate dielectric capacitance and the depletion layer capacitance. Adjusting the voltage between electrodes C_A and C_B causes the depletion layer capacitance to change so as to change the overall capacitance between electrodes C_A and C_B.
>
> Litwin describes two additional varactor operational modes at col. 5, lines 59 - 67. In the first of the additional operational modes, the depletion layer capacitance is controlled by applying a suitable voltage to the well (item 12 in Figs. 1 and 4) while electrodes C_A and C_B are maintained at respective fixed potentials. The second of the additional operational modes entails providing a fixed potential to one of electrodes C_A and C_B, connecting the other of electrodes C_A and C_B to the well (again item 12 in Fig. 4), and controlling the capacitance between electrodes C_A and C_B by way of a suitable voltage applied to the well electrode.

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On pages 1 and 2 of the present Office Action, the Examiner states that:

> Regarding claims 17-19, 21, 23-28, 38, 41, 43-46, 53, 61, 67, 69, 70-72, and 79-83, Litwin discloses in figure 4 a structure comprising a varactor which comprises a plate region 13 and a body region 12 with plate electrode

17 and a body electrode 19; a dielectric 15 of figure 1 is over the body region, the gate voltage being held constant while the body voltage is varied, and a gate electrode 16 of figure 4 (see column 5, lines 58-67). Note that applying, and varying a voltage, which results in creation of an inversion layer, adds no structural limitations to the device. Nevertheless, Litwin discloses at column 5, lines 58-67, that CA and CB are fixed potentials, and a suitable voltage applied to well 12 to control the capacitance. Also, it is mentioned that one of the CA and CB can be fixed, while the other varies, hence the limitation "body voltage . . . differ from the plate-to-body voltage and to vary as a function of the plate-to-body voltage as the plate-to-body-voltage is varied".

Independent Claim 17 is repeated below:

17. A structure comprising a varactor which comprises:

a plate region and body region of a semiconductor body, the body region being of a first conductivity type, the plate region being of a second conductivity type opposite to the first conductivity type, the plate and body regions meeting each other to form a p-n junction;

a plate electrode and a body electrode respectively connected to the plate and body regions, the plate electrode being at a plate-to-body bias voltage relative to the body electrode;

a dielectric layer situated over the semiconductor body and contacting the body region; and

a gate electrode situated over the dielectric layer at least where the dielectric layer contacts material of the body region, the gate electrode being at a gate-to-body bias voltage relative to the body electrode, the gate-to-body voltage being maintained approximately constant as the plate-to-body voltage is varied.

On page 9 of the December 2002 amendment, Applicant's Attorney pointed out that Claim 17 requires that the gate-to-body voltage be <u>maintained approximately</u> constant as the plate-to-body voltage is varied. Applicant's Attorney then stated that:

> Insofar as Applicant's attorney understands how the Examiner is attempting to analogize elements of Litwin's varactor(s) to the subject matter of Claim 17, the gate-to-body voltage in Litwin is the voltage between gate electrode 19, 29, or 39 and well 12, 22, or 32. <u>Nowhere</u> does Litwin indicate that the voltage between gate electrode 19, 29, or 39 and well 12, 22, or 32 is maintained approximately constant in any of Litwin's varactor operational modes. Hence, Litwin does not anticipate Claim 17.

To see specifically why this is true, all of Litwin's operational modes are examined individually here.

First consider the operational mode described at col. 5, lines 21 - 58, in which Litwin varies the voltage between (a) electrode C_B connected to gate electrode 16 and (b) electrode

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C_A connected jointly to source 13 and drain 14. The Examiner has analogized source 13 to the plate region of Claim 17. The Examiner has analogized gate electrode 16 to the gate electrode of Claim 17.

Using the language of the Examiner's analogies, the operational mode described at col. 5, lines 21 - 58, of Litwin consists of varying the gate-to-plate voltage. Operating in this way places no restriction on the gate-to-body voltage. Accordingly, the operational mode described at col. 5, lines 21 - 58 of Litwin does not meet the requirement of Claim 17 that the gate-to-body voltage be maintained approximately constant.

Next consider the operational mode described by Litwin at col. 5, lines 59 - 64, in which fixed potentials are applied to electrodes C_A and C_B, and a variable potential is applied to well 12. As to the Examiner's comments about Litwin disclosing an operational mode in which "CA and CB are fixed potentials, and a suitable voltage [is] applied to well 12 to control the capacitance", items C_A and C_B in Litwin are electrodes. Hence, the Examiner presumably means that fixed potentials are applied to electrodes C_A and C_B as specified at col. 5, lines 59 - 64, of Litwin.

The Examiner has analogized well 12 to the body region of Claim 17. Again using the language of the Examiner's analogies, Litwin's operational mode in which electrodes C_A and C_B are held at fixed potentials while a variable potential is applied to well 12 translates into the plate voltage and the gate voltage being held approximately constant while the body voltage is varied. Holding the gate voltage approximately constant while varying the body voltage does not produce a gate-to-body voltage that is approximately constant. Consequently, Litwin's operational mode in which electrodes C_A and C_B are held at fixed potentials and a variable potential is applied to well 12 does not meet the requirement of Claim 17 that the gate-to-body voltage be held approximately constant.

Litwin's third operational mode is described at col. 6, lines 64 - 67. As to the Examiner's comment "that one of the CA and CB can be fixed, while the other varies", the Examiner further states on page 3 of the Office Action with apparent reference to Claim 17 that "In regard to applicant's allegation that 'nowhere does Litwin indicate that the voltage between gate electrode... and well.., is maintained approximately constant', note that at column 5, lines 64-67 Litwin discloses that either CB (gate) or CA is fixed while the other voltage (along with the well) varies". Inasmuch as items C_A and C_B are electrodes, the Examiner presumably means to state that the potential on one of electrodes C_A and C_B is

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fixed. It is not clear what the Examiner means by the phrase "while the other voltage (along with the well) varies" since the other voltage is presumably the well voltage.

In any event, Litwin specifically states at col. 5, lines 64 - 67, that:

> Alternatively, a fixed potential is applied to one of the electrodes C_A or C_B, the other electrode is connected to the well and the device is controlled by a suitable voltage applied to the well.

This operational mode actually divides into two sub-modes:

A. A fixed potential is applied to electrode C_A connected to source 13 that the Examiner has analogized to the plate region of Claim 17, electrode C_B is connected to well 12 (rather than being connected to gate electrode 19), and a variable potential is applied to well 12 that the Examiner has analogized to the body region of Claim 17; and

B. A fixed potential is applied to electrode C_B connected to gate electrode 19 that the Examiner has analogized to the gate electrode of Claim 17, electrode C_A is connected to well 12 (rather than being connected to source 13), and a variable potential is applied to well 12, again analogized by the Examiner to the body region of Claim 17.

Both of these sub-modes are examined separately below.

With respect to sub-mode A, applying a fixed potential to the plate region and varying the potential on the body region means that plate-to-body voltage is varied. However, <u>no</u> restriction is placed on the gate-to-body voltage by varying the body voltage while the plate voltage is held constant. As a result, sub-mode A does not meet the requirement of Claim 17 that the gate-to-body voltage be held approximately constant.

With respect to sub-mode B, applying a fixed potential to the gate electrode while varying the potential on the body region means that the gate-to-body voltage varies. Hence, sub-mode B cannot meet the limitation of Claim 17 that the gate-to-body voltage be held approximately constant. The net result is that Litwin's disclosure at col. 5, lines 64 - 67, <u>fails</u> to satisfy the limitation of Claim 17 that the gate-to-body voltage be maintained approximately constant.

<u>Nowhere else</u> does Litwin disclose a mode in which the gate-to-body voltage, i.e., the voltage between gate electrode 19, 29, or 39 and well 12, 22, or 32, is maintained approximately constant in any of Litwin's various operational modes. Repeating what was stated on page 9 of the December 2002 amendment, Litwin does <u>not</u> anticipate Claim 17.

As further stated on page 9 of the December 2002 amendment, "<u>nothing</u> in Litwin suggests that it would be advantageous for the voltage between gate electrode 19, 29, or 39

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and well 12, 22, or 32 to be maintained approximately constant". As a result, Claim 17 is patentable over Litwin.

Claims 18 - 22, 47 - 54, and 69 all depend (directly or indirectly) from Claim 17. These fourteen dependent claims are therefore patentable over Litwin on the same basis as Claim 17.

Additionally, Litwin does not disclose the further limitation of any of dependent Claims 18, 20, 53, and 69. Separate bases are thereby provided for allowing Claims 18, 20, 53, and 69 over Litwin.

As specifically pointed out on page 9 of the December 2002 amendment,

> More particularly, dependent Claim 18 specifies that the claimed structure includes componentry for maintaining the gate-to-body voltage approximately constant. Since Litwin does not disclose that the voltage between gate electrode 19, 29, or 39 and well 12, 22, or 32 is maintained approximately constant, Litwin does not disclose the further limitation of Claim 18 that the varactor-containing structure include componentry for maintaining the gate-to-body voltage approximately constant.

With apparent reference to Claim 18, the Examiner states on page 3 of the Office Action that "In regard to applicant's argument that Litwin does not disclose componentry for maintaining the gate to body voltage constant, note that such componentry is inherent to the device of Litwin". This is incorrect. Since Litwin does <u>not</u> maintain the gate-to-body voltage approximately constant, componentry that maintains the gate-to-body voltage approximately constant <u>is not, and cannot be, inherent</u> to Litwin.

As discussed on page 10 of the December 2002 amendment,

> Dependent Claim 53 specifies that the body region includes a body contact portion more heavily doped than the surface depletion region. Litwin does not disclose that well 12, 22, or 32 includes a contact portion more heavily doped than the surface depletion layer defined by depletion boundary 41. Accordingly, Litwin does not disclose the further limitation of Claim 53.

With apparent reference to Claim 53, the Examiner states on page three of the Office Action that "In regard to applicant's argument that Litwin does not disclose that well 12 includes a contact portion more heavily doped than the surface depletion layer, note that the depletion layer is created when an appropriate voltage [is] applied to the gate, and would be more lightly doped than to the well region". It is unclear what point the Examiner is attempting to make with this statement.

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Doping a semiconductor body means introducing a dopant (or impurity) into the semiconductor body, not the amount of electronic charge present in any particular portion of a semiconductor body. A depletion layer is created by removing charge from part of a semiconductor body. The doping in a semiconductor layer that becomes a depletion layer is the same after the depletion layer is formed as before the depletion layer is formed. Consequently, the depletion layer in Litwin's device would not be more lightly doped than Litwin's well due to the removal of charge to form the depletion layer. If the Examiner is attempting to argue that the presence of a depletion layer in Litwin's well region inherently satisfies the further limitation of Claim 53 that the body region include a body contact portion more heavily doped than the surface depletion region, that argument is incorrect.

Claims 20 and 69 each recite that the inversion layer which meets the plate region selectively appears and disappears in the body region below the gate electrode. On page 10 of the December 2002 amendment, Applicant's Attorney stated that:

> Litwin does not mention that any of its varactors are operated so as to produce an inversion layer, or conducting channel, in well 12, 22, or 32 below polysilicon gate electrode 16, 26, or 36. Fig. 4 of Litwin illustrates a depletion layer but no inversion layer, or conducting channel, in well 12. The disclosure that Litwin presents at col. 5, lines 21 - 58, for the first operational mode is phased in language strongly [emphasis added] suggesting the absence of an inversion layer, or conducting channel, in the well below the gate electrode.
>
> In short, as far as Applicant's attorney can determine, none of Litwin's varactors is operated in a mode that entails forming an inversion layer, or conducting channel, in the well below the gate electrode. Litwin therefore fails to meet the further limitation of each of Claims 20 and 69 that an inversion layer which meets the plate region selectively appears and disappears in the body region below the gate electrode. Litwin also fails to meet the limitation of Claim 20 that the varactor have a capacitance dependent on the inversion area in combination with the plate area.

As to the Examiner's comment on page 1 of the Office Action "that applying, and varying a voltage, which results in creation of an inversion layer adds no structural limitations to the device", an inversion layer is a region in which the conductivity type is inverted from what is present at the same location in the absence of the inversion layer. An inversion layer is thus of opposite conductivity type to the material that longitudinally adjoins the inversion layer. In light of this, an inversion layer presents as much of a structural limitation as a recitation that a semiconductor body contains a pair of adjoining regions of opposite conductivity types. Since adjoining semiconductor regions of opposite

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conductivity types are well recognized structural limitations in U.S. patent claims, an inversion layer is also a structural limitation suitable for a U.S. patent claim. Weight in assessing patentability must therefore be given to the inversion-layer recitations in the present claims, including Claims 20 and 69.

With apparent references to Claims 20 and 69, the Examiner states on pages 3 and 4 of the Office Action that:

> In regard to applicant's argument that Litwin has no inversion layer, note that the inversion layer is inherent to the device, that is it is created by applying appropriate voltages to the pads of the varactor. This same argument holds for the channel region, which will be created by applying appropriate voltages to the gate, CA and CB in Litwin reference. Furthermore, the limitation of selectively appearing and disappearing of the inversion layer can be achieved by fixing either CA and CB, and varying the other along with the well voltage, as Litwin discloses, and as discussed in the above rejections.

It is true that an inversion layer could be created in Litwin's varactor by providing appropriate voltages to (certain parts of) Litwin's varactor. However, as mentioned in the December 2002 amendment, Litwin does not disclose that any of its varactors is operated in a manner that results in the formation of an inversion layer. Again, Litwin's disclosure at col. 5, lines 21 - 58, strongly suggests the absence of an inversion layer during operation in Litwin's first operational mode.

Nothing in Litwin indicates that an inversion layer is produced during operation in any of Litwin's other operational modes. As far as Applicant's Attorney can determine, none of Litwin's varactors is provided with voltages suitable for causing an inversion layer to be produced in any of Litwin's varactors in any of Litwin's operational modes. Contrary to what the Examiner alleges, it is not inherent that an inversion layer be produced in Litwin, let alone that an inversion layer selectively appear and disappear.

Independent Claims 23 and 38 are repeated below:

> 23. A structure comprising a varactor which comprises:
>
> a plate region and body region of a semiconductor body, the body region being of a first conductivity type, the plate region being of a second conductivity type opposite to the first conductivity type, the plate and body regions meeting each other to form a p-n junction;
>
> a plate electrode and a body electrode respectively connected to the plate and body regions, the plate electrode being at a plate-to-body bias voltage relative to the body electrode;

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a dielectric layer situated over the semiconductor body and contacting the body region; and

a gate electrode situated over the dielectric layer at least where the dielectric layer contacts material of the body region, the gate electrode being at a gate-to-body bias voltage relative to the body electrode, the gate-to-body voltage differing from the plate-to-body voltage, the gate-to-body voltage varying as a function of the plate-to-body voltage as the plate-to-body voltage is varied during operation of the varactor to cause an inversion layer that meets the plate region to selectively appear and disappear in the body region below the gate electrode.

38. A method comprising:

selecting a varactor which comprises (a) a plate region and a body region of a semiconductor body, (b) a dielectric layer situated over the semiconductor body and contacting the body region, (c) a gate electrode situated over the dielectric layer at least where the dielectric layer contacts material of the body region, and (d) a plate electrode and a body electrode respectively connected to the plate and body regions, the body region being of a first conductivity type, the plate region being of a second conductivity type opposite to the first conductivity type, the plate and body regions meeting each other to form a p-n junction and extending to a primary surface of the semiconductor body, the plate region occupying a lateral plate area along the primary surface, the varactor having a minimum capacitance dependent on the plate area, an inversion layer that meets the plate region selectively appearing and disappearing in the body region below the gate electrode as a plate-to-body bias voltage applied between the plate and body electrodes is varied during operation of the varactor, the inversion layer occupying a lateral inversion area along the primary surface, the varactor having a maximum capacitance dependent on the inversion area in combination with the plate area; and

adjusting the plate and inversion areas to control the minimum and maximum capacitances of the varactor.

Each of Claims 23 and 38 recites that an <u>inversion layer</u> which meets the plate region <u>selectively appears and disappears</u> in the body region below the gate electrode. For the reasons given in the four paragraphs that precede Claims 23 and 38, Litwin does not meet the inversion-layer limitation of Claim 23 or 38. Litwin therefore does not anticipate Claim 23 or 38.

Applicant's Attorney stated on pages 10 and 11 of the December 2002 amendment that "As far Applicant's attorney can determine, nothing in Litwin would provide a person skilled in the art with any incentive or motivation for operating any of Litwin's varactors in a mode that results in an inversion layer being formed in well 12, 22, or 23 [32] below

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polysilicon gate electrode gate 16, 26, or 36". Applicant's Attorney continued on page 11 of the December 2002 amendment with the remarks that:

> Furthermore, even if there were some reason for Litwin to use such an inversion layer, a key feature of the present invention as recited in Claims 23 and 38 is that the inversion layer selectively appears and disappears. The appearance and disappearance of the inversion layer in the present invention enables large changes to be made in the varactor capacitance. Nothing in Litwin would provide a person skilled in the art with any reason for operating Litwin's varactor in a mode where such an inversion layer selectively appears and disappears. Accordingly, Claims 23 and 38 are patentable over Litwin.
>
> Litwin also fails to meet the limitations of Claim 38 (a) that the varactor have a maximum capacitance dependent on the inversion layer in combination with the plate area and (b) that the plate and inversion areas be controlled to control the minimum and maximum capacitances of the varactor. This is an additional reason why Claim 38 is patentable over Litwin.

The comments in the two preceding paragraphs from the December 2002 amendment continue to apply.

Also, in regard to Examiner's comment on page 1 of the Office Action "that applying, and varying a voltage, which results in creation of an inversion layer adds no structural limitations to the device", Claim 38 is a method claim. Consequently, weight in assessing patentability must be given to the inversion-layer limitation of Claim 38 regardless of the Examiner's view on whether an inversion layer does, or does not, provide a structural limitation.

Claims 24 - 31 and 55 - 62 all depend (directly or indirectly) from Claim 23. Claims 39 - 46 all depend directly (directly or indirectly) from Claim 38. Dependent Claims 23 - 31, 39 - 46, and 55 - 62 are therefore variously patentable over Litwin for the same reasons as Claims 23 and 38.

As pointed out on page 11 of the December 2003 amendment, Litwin does not disclose the further limitation of any of dependent Claims 29, 39, 40, 43, and 61. Separate grounds are thereby provided for allowing Claims 29, 39, 40, 43, and 61 over Litwin.

Independent Claim 63 is repeated below:

63. A structure comprising:

> a varactor comprising (a) a plate region and a body region of a semiconductor body, (b) a plate electrode and a body electrode respectively connected to the plate and body regions, (c) a dielectric layer situated over the semiconductor body and contacting the body region, and (d) a gate electrode

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situated over the dielectric layer at least where the dielectric layer contacts material of the body region, the body region being of a first conductivity type, the plate region being of a second conductivity type opposite to the first conductivity type, the plate and body regions meeting each other to form a p-n junction, a surface depletion region of the body region extending along the dielectric layer below the gate electrode and being spaced apart from a body contact portion of the body region, the body contact portion contacting the body electrode and being more heavily doped than the surface depletion region, the plate region comprising a main plate portion and at least one finger portion continuous with the main plate portion, extending laterally away from the main plate portion, and meeting the body region therealong; and

electronic circuitry having a capacitance signal path for receiving the varactor to enable the circuitry to perform an electronic function dependent on the varactor, the plate and body electrodes being situated in the capacitance signal path.

Claim 63 recites that the body region includes a body contact portion more heavily doped than the surface depletion region. As pointed out above in connection with dependent Claim 53, Litwin does not disclose this body-contact-portion limitation[1]. Litwin therefore does not anticipate Claim 63.

Nothing in Litwin would furnish a person skilled in the art with any suggestion for providing well 12, 22, or 32 with a well contact portion more heavily doped than the well's depletion layer. Consequently, Claim 63 is patentable over Litwin.

Claims 64 - 67 all depend from Claim 63. Hence, Claims 64 - 67 are patentable over Litwin for the same reasons as Claim 63.

Litwin does not disclose the further limitation of Claim 67. Accordingly, Claim 67 is separately allowable over Litwin.

Independent Claims 71 and 79 are repeated below:

71. A method comprising:

providing a varactor which comprises (a) a plate region and a body region of a semiconductor body, (b) a plate electrode and a body electrode respectively connected to the plate and body regions, (c) a dielectric layer situated over the semiconductor body and contacting the body region, and (d) a gate electrode situated over the dielectric layer at least where the dielectric layer contacts material of the body region, the body region being of a first conductivity type, the plate region being of a second conductivity type

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[1] In the last line of the fourth paragraph on page 12 of the December 2002 amendment and in the next two paragraphs, Claim "53" should read Claim "63". It would be appreciated if the Examiner would so mark the PTO file for the present application.

opposite to the first conductivity type, the plate and body regions meeting each other to form a p-n junction;

applying (a) a plate-to-body bias voltage between the plate and body electrodes and (b) a gate-to-body bias voltage between the gate and body electrodes; and

varying the plate-to-body voltage while maintaining the gate-to-body voltage approximately constant to cause an inversion layer that meets the plate region to selectively appear and disappear in the body region below the gate electrode.

79. A method comprising:

providing a varactor which comprises (a) a plate region and a body region of a semiconductor body, (b) a plate electrode and a body electrode respectively connected to the plate and body regions, (c) a dielectric layer situated over the semiconductor body and contacting the body region, and (d) a gate electrode situated over the dielectric layer at least where the dielectric layer contacts material of the body region, the body region being of a first conductivity type, the plate region being of a second conductivity type opposite to the first conductivity type, the plate and body regions meeting each other to form a p-n junction;

applying (a) a plate-to-body bias voltage between the plate and body electrodes and (b) a gate-to-body bias voltage between the gate and body electrodes; and

varying (a) the plate-to-body voltage and (b) the gate-to-body voltage as a function of the plate-to-body voltage as the plate-to-body voltage is varied to cause an inversion layer that meets the plate region to selectively appear and disappear in the body region below the gate electrode.

The following remarks presented on pages 12 and 13 of the December 2002 amendment apply to Claims 71 and 79 and their dependent claims:

New independent Claim 71 is a method counterpart of independent Claim 17 subject to the further limitation that the plate-to-body voltage be varied, while maintaining the gate-to-body voltage approximately constant, so as to cause an inversion layer that meets the plate region to selectively appear and disappear in the body region below the gate electrode. Claim 71 is patentable over Litwin for the same reasons as Claim 17. In addition, Litwin does not meet the inversion-layer limitation of Claim 71 for the same reasons as presented above in connection with Claims 23 and 38. This establishes a separate basis for allowing Claim 71 over Litwin.

New Claims 72 - 78 all depend (directly or indirectly) from Claim 71. Claims 72 - 78 are thus patentable over Litwin on the same basis as Claim 71. Litwin also fails to disclose the further limitation of each of Claims 72 and 73, thereby providing separate bases for allowing Claims 72 and 73 over Litwin.

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New independent Claim 79 is a method counterpart of independent Claim 23. As a result, Claim 79 is patentable over Litwin for the same reasons as Claim 23.

New Claims 80 - 88 all depend (directly or indirectly) from Claim 79 and are thus patentable over Litwin on the same basis as Claim 79. In addition, Litwin fails to disclose the further limitation of dependent Claim 83. This establishes a separate basis for allowing Claim 83 over Litwin.

Once again referring to the Examiner's comment on page 1 of the Office Action "that applying, and varying a voltage, which results in creation of an inversion layer, adds no structural limitations to the device," Claims 71 and 79 are method claims. Hence, weight in assessing patentability must be given to the inversion-layer limitations of Claims 71 and 79 regardless of the Examiner's view on whether an inversion layer provides a structural limitation or not. The same applies to dependent Claims 72 - 78 and 80 - 88.

Next, consider the rejection of Claims 32 and 68 based on Litwin and Misu. Applicant's Attorney has, as mentioned above, assumed that the Examiner also intended to reject Claims 33 - 37 and 70 on the basis of Litwin and Misu rather than just Claims 32 and 68 since Claims 33 - 37 and 70 all depend from Claim 32.

Independent Claim 32 is repeated below:

32. A structure comprising:

a plate region and a body region of a semiconductor body, the body region being of a first conductivity type, the plate region being of a second conductivity type opposite to the first conductivity type, the plate and body regions extending to a primary surface of the semiconductor body and meeting each other to form a p-n junction, the plate region comprising a main plate portion and a plurality of finger portions continuous with the main plate portion, extending laterally away from the main plate portion, and meeting the body region therealong, at least two of the finger portions extending longitudinally non-parallel to one another;

a dielectric layer situated over the semiconductor body and contacting the plate region; and

a gate electrode situated over the dielectric layer at least where the dielectric layer contacts material of the body region.

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Claim 32 recites that at least two of the finger portions of the plate region extend longitudinally non-parallel to one other. Dependent Claim 68 recites the same limitation. As acknowledged by the Examiner on page 3 of the Office Action, Litwin does not disclose this limitation.

On page 3 of the Office Action, the Examiner alleges that Misu "discloses in figures 7 and 9, and the paragraph titled PURPOSE, that unparallel conductive finger shaped regions in a device prevents the crossing part of the same center frequency from continuing". The Examiner goes on there to allege that "it would have been obvious to one of ordinary skill in the art at the time of the invention to make the finger shaped electrodes in Litwin's structure unparallel to one another in order to prevent some parts of the frequency from crossing the region in which the finger shaped electrodes are being used".

Firstly, Applicant's Attorney cannot determine where Misu discloses longitudinally non-parallel fingers (or finger-shaped regions). Misu's Purpose section, cited by the Examiner, is repeated below:

> PURPOSE: To prevent the crossing part of the same center frequency from continuing to provide required characteristics by providing an area where the ratio of an electrode finger width and the gap length of adjacent electrode fingers is changed in a part where the electrode fingers with different potentials of an interdigital electrode cross.

Misu's Purpose section does seem to refer to varying the finger width. However, Applicant's Attorney sees <u>nothing</u> in the Purpose section about longitudinally non-parallel fingers.

Figs. 1, 13, 15, 17, 19, 23 - 25, 36, 43, and 45 - 48 of Misu all appear to disclose structures having electrode fingers of varying widths. The longitudinal axes of these electrode fingers are, however, all <u>substantially parallel</u> to one another[2]. None of Figs. 1, 13, 15, 17, 19, 23 - 25, 36, 43, and 45 - 48 appears to disclose longitudinally non-parallel fingers.

Applicant's Attorney is unable to determine what is shown in Misu's Figs. 7 and 9 cited by the Examiner. Figs. 7 and 9 do show dark regions that may be the ends of electrode fingers where they are interdigitated. To the extent that Applicant's Attorney has correctly interpreted Figs. 7 and 9, the longitudinal axes of these finger-shaped regions all extend <u>substantially parallel</u> to one another. As far as Applicant's Attorney can determine, Misu does <u>not</u> disclose longitudinally non-parallel fingers in Figs. 7 and 9, in the Purpose Section, or anywhere else.

Secondly, the fingers in Claims 32 and 68 are parts of the plate region and thus consist of semiconductor material. In contrast, the fingers disclosed in Misu are electrode

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[2] A longitudinal axis of an elongated object is a straight line that goes in the direction of the object's length.

fingers and thus presumably consist largely of metal. Hence, the fingers in Claims 32 and 68 are constituted quite differently than Misu's fingers.

Thirdly, nothing in Litwin indicates that any gain would be made by modifying Litwin's parallel semiconductor fingers 83, 84, and 91 to be longitudinally non-parallel. Even if Misu does, in fact, disclose longitudinally non-parallel fingers somewhere, there would be no reason for applying the teachings of Misu to Litwin. In this regard, Litwin's fingers are differently constituted than Misu's fingers. As occurs with the semiconductor fingers of Claims 32 and 68, Litwin's fingers consist of semiconductor material whereas Misu's fingers appear to consist largely of metal.

Note that providing the plate region in the varactor of the present invention with longitudinally non-parallel fingers improves the quality factor. See paragraph 262, page 71, of the present application. Nothing in Litwin suggests that using longitudinally non-parallel fingers would improve the quality factor. To the extent the Misu does disclose longitudinally non-parallel fingers, Misu is irrelevant to the patentability of Claims 32 and 68.

For the preceding reasons, Claims 32 and 68 are patentable over Litwin and Misu. In fact, since Misu adds nothing to the rejection of Claims 32 and 68, these two claims are patentable over Litwin and Misu for the same reasons, as presented in the December 2002 amendment, that Claims 32 and 68 are patentable over Litwin.

Claims 33 - 37 and 70 all depend (directly or indirectly) from Claim 32. Consequently, Claims 33 - 37 and 70 are patentable over Litwin and Misu for the same reasons as Claim 32.

Litwin does not disclose the further limitation of either of dependent Claims 36 and 70. These two dependent claims are therefore separately allowable over Litwin and Misu.

In summary, all of pending Claims 17 - 88 are patentable over the applied art. Consequently, Claims 17 - 88 should be allowed so that the application may proceed to issue.

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